Multi-Instrument Radiative Transfer and Retrieval Framework

Completed Technology Project (2017 - 2019)

Project Introduction

The objective of this proposal is to create an extensible multi-instrument atmospheric composition retrieval framework that enables software reuse while also improving science. This framework will be reusable and extensible allowing different instrument teams to use the same code base. It will help reduce the cost and risk of L2 development for new atmospheric Earth science missions. Secondly, the proposed framework will support the data fusion of radiance measurements from multiple instruments through joint retrievals. This would yield data fusion products that serve to advance Earth science research. The framework will be implemented by extending the existing OCO-2 Full Physics software (Bösch et al. 2015) to handle multiple instruments both jointly and individually. This entails both Level 1 readers and the components modeling instrument characteristics. Structural changes to the existing software will be necessary to take advantage of the new instrument modeling components. These changes enable the framework to handle multiple instruments when performing joint retrievals. The integration of fast thermal infrared (TIR) to ultraviolet (UV) radiative transfer (RT) software will allow modeling the spectra of the wide range of instrument types available for ingestion. When setting up joint retrievals the selection of the specific measurements, temporally and spatially, will be handled by data matching algorithms. To give more flexibility in terms of how the optimal estimation retrieval methods frame the problem, the framework will incorporate retrieval methodologies developed by the TES science team (Bowman et al. 2006). Assessment of the quality of linear error estimates will come from a generalized approach building upon Monte Carlo uncertainty quantification methods from OCO-2 (Hobbs et al. 2017). Once integration of the afore mentioned components is complete, work will focus on configuration of an operational joint retrieval use case. This use case will be tested and validated against recent research (Fu et al. 2016).

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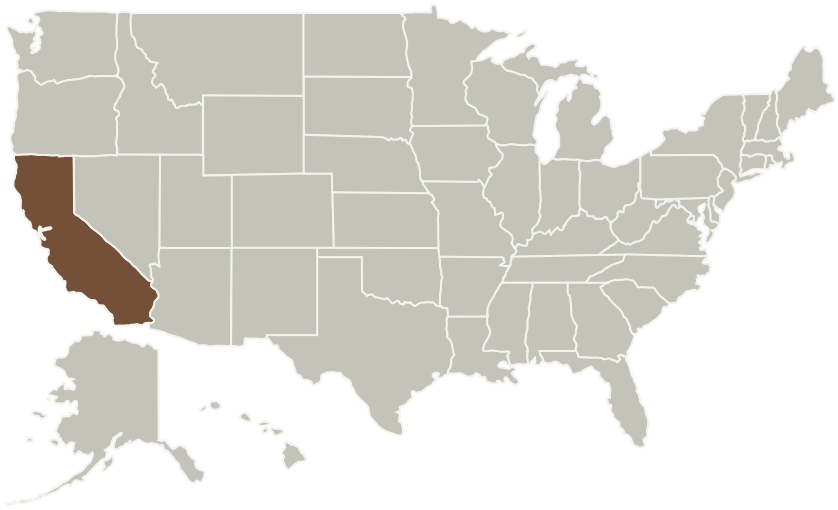
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
California Institute of Technology(CalTech)	Lead Organization	Academia	Pasadena, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

California Institute of Technology (CalTech)

Responsible Program:

Advanced Information Systems Technology

Project Management

Program Director:

Pamela S Millar

Program Manager:

Jacqueline J Le Moigne

Principal Investigator:

James Mcduffie

Co-Investigators:

Vijay Natraj
Jonathan M Hobbs
Kevin W Bowman
Karen R Piggee

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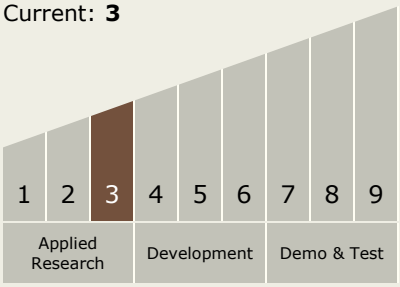
Technology Maturity (TRL)

Start: **3**
Current: **3**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.1 Software Development, Engineering, and Integrity
    - TX11.1.7 Frameworks, Languages, Tools, and Standards

Target Destination

Earth